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10/566,136	01/27/2006	Ori Hay	PHUS030257US	1720

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EXAMINER	
KOPCHIK, STEPHEN W	
ART UNIT	PAPER NUMBER
4154	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/566,136	HAY, ORI	
	Examiner	Art Unit	
	STEPHEN KOPCHIK	4154	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/27/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: The different sections of the disclosure are not clearly delineated. The examiner requests applicant insert the appropriate heading identifying each section.

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
(f) BACKGROUND OF THE INVENTION.
    (1) Field of the Invention.
    (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the

required "Sequence Listing" is not submitted as an electronic document on compact disc).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 6-8, 14-15, 16-18, 21-23 and 29-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Wyman et al (U.S. Patent #7,106,891 B2, hereafter Wyman).

3. Regarding Claim 1, Wyman discloses an apparatus for diagnostic imaging comprising:

a first memory means for storing a first diagnostic image (Col.11, Lines 20-24);

a second memory means for storing a second diagnostic image (Col.11, Lines 20-24);

a means for automatically registering the first and second diagnostic images from the first and second image memories without operator assistance (abstract, Col.7, Lines 10-29);

a means for concurrently displaying a corresponding pair of slices of the first and second registered diagnostic images (Col.8, Lines 1-6and FIG.2); and

a means for concurrently stepping the displayed slice pair corresponding through the first and second registered images (Col.8, Lines 1-3, Col.11, Lines 20-24, and FIG.6; the prior art discloses an I/O device connected to an user interfaced system, the I/O device by definition allowing the user to have some interaction with the displayed images, thus the prior art anticipates the concurrent stepping through displayed slice pairs by a user).

4. Claim 2 depends upon Claim 1, therefore the rejection of Claim 1 is incorporated into the rejection of Claim 2 and only further limitations will be addressed below.

5. Regarding Claim 2, Wyman discloses The apparatus as set forth in claim 1, wherein the registering means includes:

a means for determining an affine transform representative of misalignment of the first and second diagnostic images

(Col.9, Lines 31-67, Col.10, Lines 1-4, and Col.11, Lines 41-62); and

a means for operating on one of the first and second diagnostic images in accordance with the determined affine transform to register the first and second images (Col.9, Lines 31-44 and Col.11, Lines 41-62).

6. Claim 3 depends upon Claim 2, therefore the rejection of Claim 2 is incorporated into the rejection of Claim 3.

7. Regarding Claim 3, Wyman discloses the apparatus as set forth in claim 2, wherein the affine transform determining means includes:

a means for matching pairs of points in the first and second diagnostic images (Col.10, Lines 14-29 and 48-67; Col.11, Lines 1-17);

a means for determining differences between locations and surface normals of the matched points(Col.10, Lines 14-29 and 48-67; Col.11, Lines 1-17); and

a means for determining an affine transform which minimizes the deviation between the locations of the matched points (Col.9, Lines 56-67 and Col.10, Lines 1-4).

8. Claims 6 and 8 depend upon Claim 3, therefore the rejection of Claim 3 is incorporated into the rejections of Claims 6 and 8 and only further limitations will be addressed below.

9. Regarding Claim 6, Wyman discloses the apparatus as set forth in claim 3, wherein the affine transform means further includes:

a means for selecting a reduced fraction of points to be matched in the first and second registered images (Col.10, Lines 14-29 and 48-67 and Col.11, Lines 1-17; the prior art discloses selecting specific points within an image and that the selection of points affects the quality of the measurement, thus the prior art discloses selecting only a fraction of the available points based on which points give the greatest quality of measurement).

10. Claim 7 depends upon Claim 6, therefore the rejection of Claim 6 is incorporated into the rejection of Claim 7 and only further limitations will be addressed below.

11. Regarding Claim 7, Wyman discloses the apparatus as set forth in claim 6, further including:

a means for removing matched pairs of points which fail to meet preselected criteria (Col.10, Lines 14-29 and 48-67 and

Col.11, Lines 1-17; the prior art discloses selecting specific points within an image and that the selection of points affects the quality of the measurement, thus the prior art discloses selecting only a fraction of the available points based on which points give the greatest quality of measurement which would necessitate the removal of points that will not be used to optimize the affine transform).

12. Regarding Claim 8, Wyman discloses the apparatus as set forth in claim 3, further including:

a selectively non-uniform random number of point reducing means, which reduces a number of points by one of selectively using prior knowledge and randomly while oversampling points for optimizing registration along a direction in which the stepping means steps the slice pairs (Col.11, Lines 8-14; the prior art anticipates selecting one or more sets of arbitrary or random points).

13. Claims 14 and 15 depend upon Claim 3, therefore the rejection of Claim 3 is incorporated into the rejections of Claims 14 and 15 and only further limitations will be addressed below.

14. Regarding Claim 14, Wyman discloses the apparatus as set forth in claim 3, further including:

a means for combining an operator selected plurality of slices in each of the displayed slice images (Col.11, Lines 18-29 and FIG.2).

15. Regarding Claim 15, Wyman discloses the apparatus as set forth in claim 3, further including:

a diagnostic imaging apparatus connected with the first memory means for generating the first diagnostic image representation of a region of interest of a patient (Col.11, Lines 18-29); and

an archive means, from which the second image representation of the volume of interest of the patient taken at an earlier time is withdrawn and loaded into the second memory means (Col.11, Lines 18-29).

16. Regarding Claim 16, Claim 16 is a method claim corresponding to Claim 1, therefore Claim 16 has been analyzed and rejected with respect to Claim 1.

17. Regarding Claim 17, Claim 17 is a method claim corresponding to Claim 2, therefore Claim 17 has been analyzed and rejected with respect to Claim 2.

18. Regarding Claim 18, Claim 18 is a method claim corresponding to Claim 3, therefore Claim 18 has been analyzed and rejected with respect to Claim 3.

19. Regarding Claim 21, Claim 21 is a method claim corresponding to Claim 6, therefore Claim 21 has been analyzed and rejected with respect to Claim 6.

20. Regarding Claim 22, Claim 22 is a method claim corresponding to Claim 7, therefore Claim 22 has been analyzed and rejected with respect to Claim 7.

21. Regarding Claim 23, Claim 23 is a method claim corresponding to Claim 8, therefore Claim 23 has been analyzed and rejected with respect to Claim 8.

22. Regarding Claim 29, Claim 29 is a method claim corresponding to Claim 14, therefore Claim 29 has been analyzed and rejected with respect to Claim 14.

23. Regarding Claim 30, Claim 30 is a method claim corresponding to Claim 15, therefore Claim 30 has been analyzed and rejected with respect to Claim 15.

Claim Rejections - 35 USC § 103

24. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

25. Claims 4-5 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wyman as applied to Claim 3 above.

26. Regarding Claim 4, Wyman fails to disclose wherein the point matching means includes:

a processing means which implements a K-D tree matching algorithm.

While Wyman fails to explicitly disclose the K-D tree matching alogorithm, it does explicitly disclose optimization methods for determining the proper affine transform for two

images which would necessarily incorporate point matching within the respective image (Col.9, Lines 56-67 and Col.10, Lines 1-4). Because K-D tree matching is well known in the art, it would have been obvious to one of ordinary skill in the art at the time of invention to use a K-D tree matching algorithm for point matching as applied in the Wyman reference. Therefore, Claim 4 is rendered unpatentable as being obvious in light of Wyman and the state of ordinary skill in the art at the time of invention.

27. Claim 5 depends upon Claim 4, therefore the rejection of Claim 4 is incorporated into the rejection of Claim 5 and only further limitations will be addressed below.

28. Regarding Claim 5, Wyman discloses the apparatus as set forth in claim 4, wherein the deviation minimizing means includes: a processor which performs a Levenberg-Marquardt error minimization algorithm (Col.9, Lines 65-67 and Col.10, Lines 1-4).

29. Regarding Claim 19, Claim 19 is a method claim corresponding to Claim 4, therefore Claim 19 has been analyzed and rejected with respect to Claim 4.

30. Regarding Claim 20, Claim 20 is a method claim corresponding to Claim 5, therefore Claim 20 has been analyzed and rejected with respect to Claim 5.

31. Claims 9-13 and 24-28 rejected under 35 U.S.C. 103(a) as being unpatentable over Wyman as applied to Claim 3 above and in further view of applicant's cited prior art, Betke et al (Margrit Betke, Harrison Hong, and Jane P. Ko, *Automatic 3D Registration of Lung Surfaces in Computed Tomography Scans*, MICCAI 2001, LNCS 2208, pp. 725-733, hereafter "Betke").

32. Regarding Claim 9, Wyman fails to disclose wherein the registering means further includes:

a means for converting the first and second diagnostic images into feature image representations, the affine transform determining means operating on the first and second features representations to determine the affine transform.

Betke discloses wherein the registering means further includes:

a means for converting the first and second diagnostic images into feature image representations, the affine transform determining means operating on the first and second features representations to determine the affine transform (Page 729).

Wyman explicitly states that feature-based comparison is an type of image comparison but only discloses examples using voxel-based comparison (Col.9, Lines 7—9). One of ordinary skill in the art at the time of invention would look to prior art discussing feature-based comparison as Wyman contemplates it as an alternative method. Therefore, the combined teachings of Wyman and Betke would render Claim 9 obvious because a person of ordinary skill in the art at the time of invention would find sufficient motivation to combine the prior art references in a manner, with a reasonable expectation of success, to achieve the claimed invention.

33. Claim 10 depends upon Claim 9, therefore the rejection of Claim 9 is incorporated into the rejection of Claim 10 and only further limitations will be addressed below.

34. Regarding Claim 10, Wyman fails to disclose wherein the features generating means includes:

a segmentation means, which segments appropriate target organs in the diagnostic images; and

a feature extraction means that extracts a set of features to be matched in the diagnostic images.

Betke discloses wherein the features generating means includes:

a segmentation means, which segments appropriate target organs in the diagnostic images(Pages 727 and 729); and

a feature extraction means that extracts a set of features to be matched in the diagnostic images(Pages 727 and 729).

Wyman explicitly states that feature-based comparison is an type of image comparison but only discloses examples using voxel-based comparison (Col.9, Lines 7—9). One of ordinary skill in the art at the time of invention would look to prior art discussing feature-based comparison as Wyman contemplates it as an alternative method. Therefore, the combined teachings of Wyman and Betke would render Claim 9 obvious because a person of ordinary skill in the art at the time of invention would find sufficient motivation to combine the prior art references in a manner, with a reasonable expectation of success, to achieve the claimed invention.

35. Claim 11 depends upon Claim 10, therefore the rejection of Claim 10 is incorporated into the rejection of Claim 11 and only further limitations will be addressed below.

36. Regarding Claim 11, Wyman fails to disclose wherein the features image generating means includes:

a thresholding segmentation means, which segments lungs in the diagnostic images using a predetermined threshold and the features defined as the surface points of the lungs extracted by assigning a tissue on one side of a boundary of an organ of interest a first value and a tissue or air on another side of the boundary of the organ of interest a second value, distinct from the first value; and

a means for extracting a boundary layer of voxels of the first value which adjoin voxels of the second value.

Betke discloses wherein the features image generating means includes:

a thresholding segmentation means, which segments lungs in the diagnostic images using a predetermined threshold and the features defined as the surface points of the lungs extracted by assigning a tissue on one side of a boundary of an organ of interest a first value and a tissue or air on another side of the boundary of the organ of interest a second value, distinct from the first value (Page 729); and

a means for extracting a boundary layer of voxels of the first value which adjoin voxels of the second value (Page 729).

Wyman explicitly states that feature-based comparison is an type of image comparison but only discloses examples using voxel-based comparison (Col.9, Lines 7—9). One of ordinary skill in the art at the time of invention would look to prior art discussing feature-based comparison as Wyman contemplates it as an alternative method. Therefore, the combined teachings of Wyman and Betke would render Claim 9 obvious because a person of ordinary skill in the art at the time of invention would find sufficient motivation to combine the prior art references in a manner, with a reasonable expectation of success, to achieve the claimed invention.

37. Claim 12 depends upon Claim 11, therefore the rejection of Claim 11 is incorporated into the rejection of Claim 12 and onlu further limitations will be addressed below.

38. Regarding Claim 12, Wyman fails to disclose further including:

a scaling means scaling the boundary layers of the two images; and

a normalizing means for normalizing the boundary layers, prior to the surface images being operated on by the affine transform means.

Betke discloses further including:

a scaling means scaling the boundary layers of the two images (Page 728); and

a normalizing means for normalizing the boundary layers, prior to the surface images being operated on by the affine transform means (Page 728; while the prior art does not explicitly disclose normalizing the image prior to transformation, it is well known in the art that normalization of an image prior to processing will produce consistent and optimal results, thus normalization is assumed to be part of the prior art's preprocessing steps).

Wyman explicitly states that feature-based comparison is an type of image comparison but only discloses examples using voxel-based comparison (Col.9, Lines 7—9). One of ordinary skill in the art at the time of invention would look to prior art discussing feature-based comparison as Wyman contemplates it as an alternative method. Therefore, the combined teachings of Wyman and Betke would render Claim 9 obvious because a person of ordinary skill in the art at the time of invention would find sufficient motivation to combine the prior art references in a manner, with a reasonable expectation of success, to achieve the claimed invention.

39. Regarding Claim 13, Wyman discloses wherein the affine transform determining means further includes:

a transform processors, which operates on one of the feature images with the determined affine transform to facilitate iterative operation of the affine transform determining means to optimize the affine transform (Col.12, Lines 27-44 and FIG.7).

40. Regarding Claim 24, Claim 24 is a method claim corresponding to Claim 9, therefore Claim 24 has been analyzed and rejected with respect to Claim 9.

41. Regarding Claim 25, Claim 25 is a method claim corresponding to Claim 10, therefore Claim 25 has been analyzed and rejected with respect to Claim 10.

42. Regarding Claim 26, Claim 26 is a method claim corresponding to Claim 11, therefore Claim 26 has been analyzed and rejected with respect to Claim 11.

43. Regarding Claim 27, Claim 27 is a method claim corresponding to Claim 12, therefore Claim 27 has been analyzed and rejected with respect to Claim 12.

44. Regarding Claim 28, Claim 28 is a method claim corresponding to Claim 13, therefore Claim 28 has been analyzed and rejected with respect to Claim 13.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHEN KOPCHIK whose telephone number is (571)270-7117. The examiner can normally be reached on Monday-Thursday 9:30 AM - 6:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vu Le can be reached on (571) 272-7332. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/STEPHEN KOPCHIK/
Examiner, Art Unit 4154

/Vu Le/
Supervisory Patent Examiner, Art Unit 4154